

Preliminary Evaluation of Home-Based Rapid Tests versus Standard Laboratory Diagnostics for Common Sexually Transmitted Infections in a Conservative Cultural Setting: A Pilot Cross-Sectional Study



Sirwan Aziz Akbar

Department of Pharmacy, Sulaimani Technical Medical Institute, Sulaimani Polytechnic University, Sulaimani, Kurdistan Region, Iraq

ABSTRACT

Many sexually transmitted infections (STIs), such as *Chlamydia trachomatis* (CT), *Neisseria gonorrhoeae* (NG), and *Trichomonas vaginalis* (TV), frequently progress without symptoms, which can lead to missed diagnoses and untreated cases with serious health effects. Home-based rapid diagnostic tests offer a private and convenient option compared to clinic visits, especially in places where stigma and privacy concerns make it challenging to access care. In this pilot cross-sectional study, we worked with 33 individuals (20 community participants and 13 hospital-referred patients) from the Kurdistan Region of Iraq. They collected their swab and urine samples, which were tested at home for CT, NG, and TV. We compared these results to standard hospital-based nucleic acid amplification tests and calculated measures such as sensitivity, specificity, predictive values, and Cohen's kappa coefficient (κ). The prevalence rates were 9.1% (3/33) for CT, 6.1% (2/33) for NG, and 4.2% (1/24 females) for TV, as only females were eligible for TV testing according to the manufacturer's instructions. Home-based testing for CT matched hospital results exactly (all metrics 100%; $\kappa = 1.0$). For NG, home-based testing achieved 100% sensitivity and negative predictive value (NPV), 96.8% specificity, 66.7% positive predictive value (PPV), 97.0% accuracy, and $\kappa = 0.786$, showing strong agreement with one false-positive result. For TV, sensitivity and NPV were 100%, specificity was 95.7%, PPV was 50.0%, overall accuracy was 95.8%, and $\kappa = 0.65$, also showing strong agreement. This investigation is the first study in the Kurdistan Region to compare home-based STI rapid tests with hospital diagnostics, and the findings support their potential as a reliable and culturally acceptable complement to clinic-based screening. Larger population-based studies are needed to confirm these results and guide the integration of home-based STI testing in public health strategies.

Index Terms: Sexually Transmitted Infections, Home-Based Rapid Diagnostic Tests, Conservative Culture, Cross-Sectional Study, Chlamydia, Gonorrhea, Trichomoniasis

Access this article online

DOI:10.21928/uhdjst.v10n2y2026.pp122-133

E-ISSN: 2521-4217

P-ISSN: 2521-4209

Copyright © 2026 Sirwan Aziz Akbar. This is an open access article distributed under the Creative Commons Attribution Non-Commercial No Derivatives License 4.0 (CC BY-NC-ND 4.0)

1. INTRODUCTION

Sexually transmitted infections (STIs), formerly known as sexually transmitted diseases, are caused by the transmission of pathogenic microorganisms from one sexual partner to another through vaginal, anal, or oral contact. STIs may also

Corresponding author's e-mail:

Sirwan Aziz Akbar Department of Pharmacy, Sulaimani Technical Medical Institute, Sulaimani Polytechnic University, Sulaimani, Kurdistan Region, Iraq. Email: sirwan.akbar@spu.edu.iq

Received: 25-05-2026

Accepted: 23-07-2026

Published: 06-09-2026

be transferred from mother to child or through tissue and blood product transfer. The only known natural reservoir for STI pathogens is humans. STIs can be avoided through providing education and the implementation of barrier control measures [1]. Microorganisms that cause STIs include bacteria, viruses, parasites, and fungi [2]. Infections such as hepatitis B, herpes simplex virus, HIV, and HPV are treatable but not curable. In contrast, *Chlamydia trachomatis* (CT), *Neisseria gonorrhoeae* (NG), *Trichomonas vaginalis* (TV), and syphilis (*Treponema pallidum*) are the most prevalent curable STIs [3]. STIs have a high prevalence in most countries, particularly affecting people between the ages of 15 and 50 years, including infants [4], and they represent a serious threat to global health and should be acknowledged by all public health agencies.

Over 1 million new cases of STIs are reported every day, most of which are asymptomatic. This burden is attributed to an estimated 374 million new infections annually, including curable STIs [5]. Pregnancy complications are also affected [6]. In addition, STIs directly impact the health of sexuality and reproduction, raising the risk of HIV, infertility, cancer, and stigma. Moreover, a serious threat to lowering the worldwide burden of STIs is the emergence of drug resistance [3], [5].

CT and NG infections are two of the most prevalent STIs worldwide. The former is a Gram-negative, obligatory intracellular bacterium that is non-motile. CT comprises 15 serovars that can cause nongonococcal urethritis, epididymitis, proctitis, cervicitis, acute salpingitis, and pelvic inflammatory disease (PID). Notably, infections with CT are often without symptoms in both men and women. In addition, neonates born to mothers with CT infection show a substantially increased risk of developing pneumonia and inclusion conjunctivitis [3], [7], [8]. Accurate detection of CT is essential. Historically, several methods have been used for CT detection in the clinical laboratory, including cell culture, direct fluorescent antibody testing, and enzyme immunoassays. Recent methods for CT detection include direct DNA probe assays and nucleic acid amplification tests (NAATs). While cell culture was once considered the gold standard method for detection of CT due to its specificity, recent studies have shown that NAATs are more sensitive in clinical settings. Consequently, direct DNA probe assays and NAATs have largely supplanted culture in many laboratories [8]. NG, also known as the gonococcus (GC), is a non-motile, Gram-negative diplococcus that causes gonorrheal infections, which are often asymptomatic. In women, untreated infections may progress to PID, presenting

as endometritis, salpingitis, pelvic peritonitis, or tubo-ovarian abscesses. Only a small fraction of individuals with gonorrhea may progress to develop disseminated gonococcal infection [9]. Culture methods that isolate NG bacteria on selective medium or that observe diplococci in Gram-stained smears are considered highly sensitive clinically; however, they are highly dependent on appropriate specimen processing. Furthermore, inadequate specimen storage and transportation may lead to loss of organism viability and to false-negative results. For these reasons, modern methods used for the detection of GC encompass direct DNA probe assays and NAATs [10].

Due to technological issues, first-generation NAATs for CT and GC have limited their performance. The Aptima Combo 2 Assay represents a second-generation NAAT that uses target capture, transcription mediated amplification (TMA), and dual kinetic assay (DKA) technologies to facilitate specimen processing, amplify target ribosomal ribonucleic acid (rRNA), and identify amplified products. When used on the Panther System, this assay enables the qualitative detection of CT and/or GC rRNA in specimens collected by both clinicians and patients [8].

TV is a parasite and considered one of the most common curable STIs. In women, it can cause vaginitis, urethritis, and cervicitis, often presenting with vaginal discharge, vulvovaginal soreness, and dysuria. Potential complications include premature labor, post-abortion infections, PID, infertility, and cervical cancer. While in men, it may include penile discharge, testicular pain, dysuria, and frequent urination [11]. Approximately 10–50% of infections in women, and an even higher proportion in men, are asymptomatic [12], [13]. Traditional culture methods are costly, time-consuming, and relatively insensitive, while wet-mount microscopy, although inexpensive and rapid, has a sensitivity of only 35–80% compared with culture and depends heavily on the microscopist's expertise. In contrast, the Aptima TV Assay, which serves as an *in vitro* qualitative NAAT for detecting TV rRNA on the Panther System – is regarded as a more reliable and sensitive method. This assay employs advanced molecular technologies, including target capture, TMA, and hybridization protection assay (HPA), to achieve superior sensitivity and specificity [13].

STIs can practically be classified based on their clinical presentations: Genital, anal, perianal, or oral ulcers; urethral or vaginal discharge; and genital warts. Around 90% of STIs do not show any symptoms [14]. Study shows that people often have self-conscious emotions, such as shame, guilt, and

embarrassment, when they seek information or discuss STI testing, especially between young people. This discomfort can prevent them from accessing healthcare facilities and requesting testing and treatment, which can have undesirable consequences on their health. Several of the triggers for these self-conscious emotions have been recognized as reasons why people who think they have STIs do not seek testing. These triggers include feeling ashamed of having sex without protection, telling friends or a partner, thinking about being tested, going to STI clinics and waiting in the waiting area, having unpleasant experiences with healthcare workers, receiving a positive result from an STI test, having to inform sexual partners about a positive diagnosis, and seeking treatment within healthcare settings. Some people try to avoid embarrassment by going to a pharmacy that they do not usually visit for treatment [15].

Recent political, socioeconomic, and cultural conditions in Iraq influence the inadequate profile of STIs. These conditions indicate factors that facilitate the enhanced transmission of STIs and the phenomenon of underreporting. War, displacement, poverty, unemployment, and family disruptions have all played a role in the spread of STIs and the lack of reporting. In addition, more access to media like TV, cell phones, and the Internet may also encourage more open attitudes toward sex among many young Iraqis. The period of university education in Iraq also signifies a return to mixed-gender education after 6 years of segregation during middle and high school, which may lead to more high-risk sexual behavior [16]. According to Lebni *et al.* (2021), sex work occurs for various reasons, including economic hardship, marital breakdown, immigration, and drug use, as well as familial instability, societal pressure, consumerism, social insecurity, and personality factors such as meekness and inefficiency [17].

STIs remain a significant public health concern worldwide [18]. In conservative regions such as Iraq and the Kurdistan Region, cultural stigma and privacy concerns often stop people from getting tested at clinics. Home-based STI test kits could provide a more private and acceptable option. This pilot study aimed to evaluate the agreement between homebased rapid STI tests and standard laboratory diagnostics for chlamydia, gonorrhea and trichomoniasis among individuals in a culturally conservative population, to evaluate the feasibility and cultural acceptability of home-based STI testing, to explore participant-reported barriers to clinic-based testing, and to provide foundational data for expanded studies in similar sociocultural settings as well as assess the availability of these kits in local laboratories,

pharmacies, and hospitals. The goal is to determine whether increased access to home testing can support individuals who experience self-consciousness in clinical settings, thereby helping to reduce the undetected spread and progression of STIs in the community.

To the best of our knowledge, this is the first research in the Kurdistan Region that specifically tests the accuracy of home-based rapid tests in the diagnosis of CT, NG, and TV directly against conventional hospital-based diagnostics. The evidence presented in this region is innovative and specifically applicable due to the fact that current information regarding the low- and middle-income environments is limited, and most of the previous studies have focused on the high-income nations. Through this gap, our research provides new insights into the feasibility of implementing home-based STI testing in a conservative cultural setting where stigmas and lack of access to healthcare usually delay diagnosis and treatment. We hypothesized that home-based rapid antigen tests for CT, NG, and TV would demonstrate high diagnostic agreement with standard laboratory-based NAATs and could, therefore, serve as a feasible complementary screening approach in culturally conservative settings.

2. METHODS AND MATERIALS

A pilot cross-sectional study was conducted with 33 individuals aged 21–49 years (nine males, 24 females). The study included 20 sexually active community participants (Participants 1–20) and 13 hospital-referred patients (Patients 1–13) suspected of having STIs by their physicians. Demographic data, including sex and age range, were collected for all individuals. Table 1 summarizes the baseline demographic characteristics of patients and community participants. All individuals reported inconsistent use of protective measures.

For clarity, hospital-referred symptomatic individuals are referred to as “patients,” whereas community-based asymptomatic individuals are referred to as “participants.” When both groups are discussed collectively, the term “individuals” is used throughout this manuscript.

Each individual underwent both a home-based rapid test kit for detection of CT, NG, and TV (Home Health UK), and a standard laboratory diagnostic (NAAT) using the Hologic Aptima Combo 2 Assay for detection CT/NG and the Aptima TV Assay for detection of TV. To ensure consistency, each individual (male and female) provided three swabs during the same clinical appointment for the

TABLE 1: Baseline characteristics of the enrolled individuals

Group	ID (s)	Number	Sex	Age range (years)	Symptom Status
Patients	1–7, 9	8	Female	21–45	Symptomatic
	8, 10–13	5	Male	23–46	Symptomatic
Participants	1–8, 12–19	16	Female	22–49	Asymptomatic
	9–11, 20	4	Male	24–47	Asymptomatic
Total	—	33	—	21–49	13 Symptomatic, 20 Asymptomatic

IDs indicate participant numbering used in the study; ranges represent consecutive IDs. For clarity, participants and patients with identical diagnostic outcomes have been grouped together in this table. Total sample size=33 (13 patients, 20 participants)

rapid home-based test (one each for CT, NG, and TV). In addition, all female individuals provided two extra vaginal swabs for NAAT (CT/NG and TV detection), while all male individuals provided a first-catch urine specimen, which was divided into two aliquots: One for CT/NG and the other for TV detection.

2.1. Participant Selection

Individuals were enrolled based on their willingness to provide informed consent. Inclusion criteria: Age ≥ 18 years, sexually active within the past 6 months, and willingness to perform both home- and hospital-based STI tests. Exclusion criteria: Refusal to provide consent, use of STI treatment within the previous 30 days, and inability to complete both tests.

Hospital-referred patients were included if they presented with clinical signs and symptoms suggestive of STIs (e.g., vaginal discharge, dysuria, pelvic pain, or urethritis) and were therefore categorized as symptomatic. In contrast, community participants were recruited as part of the screening arm of the study, reported no symptoms at the time of sampling, and were categorized as asymptomatic.

2.2. Home-Based Rapid Testing

2.2.1. CT

Testing was conducted using the Chlamydia Rapid Test Cassette (Swab/Urine), REF: ICH-502 (ALLTEST Biotech Co., Ltd., Hangzhou, China), a qualitative lateral flow immunoassay for the detection of CT antigen in cervical, vaginal, urethral swabs, or urine. Female individuals provided vaginal or endocervical swabs, while male individuals provided urethral swabs, following the manufacturer's instructions. Male individuals were asked to avoid urination for at least 1 h before collection to ensure sufficient antigen concentration. Swabs were rotated gently at the collection site and held for ~ 15 s. For extraction, 5 drops (~ 300 μ L) of Reagent 1 were added to the extraction tube, followed by insertion and rotation of the swab (10–15 times) and incubation for 2 min. Then, 6 drops (~ 250 μ L) of Reagent 2 were added,

and the swab was rotated again until the solution cleared with a slight green or blue tint. If the swab contained blood, the solution appeared yellow or brown. After 1 min, the swab was removed, and the liquid was retained by squeezing the tube. A dropper tip was attached, and 3 drops (~ 100 μ L) of the processed specimen were applied to the cassette. Results were read after 10 min but not beyond 20 min. A visible control (C) and test (T) line indicated a positive result; a control line only indicated a negative result. Tests were invalid if the control line did not appear.

2.2.2. NG

Testing was conducted using the Gonorrhea Rapid Test Cassette (Swab), REF: ICG-502 (ALLTEST Biotech Co., Ltd., Hangzhou, China), a qualitative lateral flow immunoassay for NG antigen detection in cervical, vaginal, or urethral swabs. The procedure was identical to that for CT, except that 8 drops (~ 320 μ L) of Reagent 1 and 5 drops (~ 200 μ L) of Reagent 2 were used. Results were interpreted at 10 min but not beyond 30 min.

2.2.3. TV

Testing was performed using the TV Rapid Test Cassette (Vaginal Swab), REF: ITV-502 (Acro Biotech, Inc., Rancho Cucamonga, CA, USA), a qualitative immune-chromatographic assay for TV antigen detection in vaginal swabs. Only vaginal swabs were collected, as validated by the manufacturer. Extraction involved 10 drops (~ 560 μ L) of buffer, with the swab rotated ≥ 10 times and soaked for 1 min. Three drops (~ 100 μ L) of the extracted specimen were applied to the cassette. Results were read at 15 min but not after 20 min.

2.3. NAAT

2.3.1. Aptima combo 2 assay for CT and NG

The Aptima Combo 2 Assay (Hologic Inc., San Diego, CA, USA) is a NAAT that uses target capture and rRNA amplification for qualitative detection and differentiation of CT and NG.

Vaginal swab collection (females): Specimens were collected

using the Aptima vaginal swab specimen collection kit (Hologic) per manufacturer guidelines. Briefly, the swab was inserted ~5 cm beyond the introitus, rotated gently for 10–30 s, and withdrawn without touching external skin. The swab was placed into the transport tube, the shaft broken, and the cap closed. Specimens were maintained at 2–30°C and examined within 60 days.

Urine collection (male individuals): First-catch urine was collected using the Aptima urine specimen collection kit (Hologic). Male individuals were asked to avoid urination for at least 1 h before collection. Approximately 20–30 mL of the initial urine stream was collected without preservatives. From there, 2 mL was transferred into the Aptima urine transport tube using the provided pipette. Specimens were stored/transported at 2–30°C and analyzed within 30 days. If initially stored in the primary container, urine was transferred into the transport tube within 24 h.

Processed swabs and urine were analyzed using the Panther System (Hologic), an automated NAAT platform that utilizes target capture, TMA, and DKA technologies to streamline specimen processing, amplify target rRNA, and detect amplicons, respectively, with high sensitivity and specificity. Results were reported as positive, negative, or invalid according to manufacturer guidelines.

2.3.2. Aptima TV assay

Vaginal swabs were collected as described above using the Aptima vaginal swab specimen collection kit (Hologic). Processed swabs were analyzed using Aptima TV Assay on the Panther System, which applies TMA and HPA technologies for the detection of TV rRNA. Results were automatically classified as positive, negative, or invalid according to manufacturer guidelines.

2.4. Statistical Analysis

We evaluated diagnostic performance using 2×2 contingency tables, categorizing results as true positives (TP), true negatives (TN), false positives (FP), and false negatives (FN). Sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), and Cohen's kappa coefficient (κ) were calculated. Fisher's exact test (two-tailed) was used to assess agreement between home-based and laboratory-based tests. $P < 0.05$ was considered statistically significant [19]–[23].

2.5. Ethical Considerations

The study protocol was reviewed and approved by the Ethics Committee of Sulaimani Polytechnic University.

All participants provided informed consent and were assured of anonymity and confidentiality. Furthermore, recruitment and communication were adapted to respect cultural sensitivities.

3. RESULTS

3.1. Baseline Demographics or Characteristics

The study population comprised 33 individuals: 13 hospital-referred patients and 20 community participants. Among the patients, eight were females aged 21–45 years and five were males aged 23–46 years. Among community participants, 16 were females aged 22–49 years and four were males aged 24–47 years. Notably, all hospital-referred patients were symptomatic, whereas all community participants were asymptomatic, as summarized in Table 1.

Following demographic assessment, all collected specimens were analyzed using both home-based rapid diagnostic tests and standard hospital-based laboratory methods. The main outcomes included diagnostic agreement, sensitivity, and specificity for CT, NG, and TV. The results are presented in detail below, with comparisons drawn between patient-collected and hospital-performed testing.

All eligible specimens were successfully analyzed using both home-based rapid tests and the hospital-based NAATs. No rapid test or NAAT results were invalid, inconclusive, or missing for the specimens included in the final analysis.

As summarized in Table 2, among the 33 individuals tested for CT, three tested positive by both the home-based and hospital-standard tests (Patients 3, 7; Participant 15), while the remaining 30 individuals were negative on both platforms. There were no discordant results between the two testing methods. This complete concordance indicates a 100% agreement between the home-based and hospital-standard diagnostic tests for CT in this study sample.

TABLE 2: Diagnostic test results for 33 individuals comparing home-based and hospital-standard STI testing for *Chlamydia trachomatis*

ID (s)	Home-based STI test	Hospital-standard STI test
Patient 1–2, 4–6, 8–13 ^a	Negative	Negative
Patient 3,7 ^b	Positive	Positive
Participant 1–14,16–20 ^a	Negative	Negative
Participant 15 ^b	Positive	Positive

^aFor clarity, participants and patients with identical test results have been grouped together in this table. ^bFemales individual. STI: Sexually transmitted infections

Table 3 presents the 2×2 contingency table comparing the home-based STI test with the hospital-standard laboratory test for CT. Among the 33 individuals tested, three tested positive on both platforms; (TP = 3) (Patient number 3, 7, and Participant 15), and TN was 30, with no FPs (FP = 0) or FNs (FN = 0). This results in perfect diagnostic agreement between the two methods.

As shown in Table 4, the home-based test for CT demonstrated excellent diagnostic performance when compared with the hospital-standard reference test. Of the 33 individuals, three tested positive and 30 tested negative in both testing methods. This finding offered a sensitivity of 100% and a specificity of 100%, indicating that the home test correctly detected all positive and negative cases. Both the PPV and NPV were also 100%, showing perfect agreement between the test results. The overall diagnostic accuracy was 100%. Moreover, Cohen's Kappa coefficient (κ) was 1.00, indicating perfect agreement between the outcomes of both tests. These findings suggest that the home-based testing approach performed ideally in this sample and may be a highly reliable alternative for CT screening under similar conditions. The association between

TABLE 3: Diagnostic agreement between home-based STI tests and hospital-standard laboratory STI tests of *Chlamydia trachomatis* (2x2 contingency table)

	Hospital test positive	Hospital test negative	Total
Home test positive	3 (TP)	0 (FP)	3
Home test negative	0 (FN)	30 (TN)	30
Total	3	30	33

STI: Sexually transmitted infections, TP: True positives, TN: True negatives, FN: False negatives, FP: False positives

TABLE 4: Diagnostic performance metrics for home-based STI testing for *Chlamydia trachomatis*

Metric	Formula	Result (%)
Sensitivity	$TP/(TP+FN)=3/(3+0)$	100
Specificity	$TN/(TN+FP)=30/(30+0)$	100
PPV	$TP/(TP+FP)=3/(3+0)$	100
NPV	$TN/(TN+FN)=30/(30+0)$	100
Accuracy	$(TP+TN)/Total=(3+30)/33$	100
Cohen's kappa (κ) ^a	$(Po-Pe)/(1-Pe)=$	1.00

^aCohen's Kappa (κ)= $(Po-Pe)/(1-Pe)$, where Po=observed agreement, Pe=expected agreement. Po (observed agreement)= $(TP+TN)/N=(3+30)/33=33/33=1$. Pe (expected agreement)= $[(TP+FP)/N \times (TP+FN)/N] + [(FN+TN)/N \times (FP+TN)/N]$. Pe= $[(3+0)/33 \times (3+0)/33] + [(0+30)/33 \times (0+30)/33]=0.834$. Cohen's Kappa (κ)= $(1-0.834)/(1-0.834)=1.00$. STI: Sexually transmitted infections, TP: True positives, TN: True negatives, FN: False negatives, FP: False positives, NPV: Negative predictive value, PPV: Positive predictive value

home-based and hospital-standard test results for CT was very statistically significant ($P = 0.0002$, Fisher's Exact Test, two-tailed).

Table 5 summarizes the results of home-based versus hospital-standard STI testing of NG among 33 individuals. To enhance clarity and brevity, individuals with identical test outcomes have been grouped. Among 33 individuals, 30 tested negative on both platforms, two tested positive on both tests (Patient 9 and Participant 5), and one (Participant 9) showed a false-positive result on the home-based test. No FNs were observed.

Table 6 summarizes the diagnostic accuracy of the home-based STI tests compared with hospital-standard laboratory STI results, which categorize test outcomes in the Table 5 datasets. Among 33 individuals, TP = 2 (Patient number 9 and Participant 5), FP = 1 (Participant 9), TN = 30, and there were no FNs (FN = 0), indicating that all hospital-confirmed positive cases were accurately detected by the home-based test.

As shown in Table 7, the home-based rapid STI test for NG demonstrated excellent diagnostic performance: sensitivity = 100%, and NPV = 100%, meaning all true

TABLE 5: Diagnostic test results for 33 individuals comparing home-based and hospital-standard STI testing of *Neisseria gonorrhoeae*

ID	Home-based STI test	Hospital-standard STI test
Patient 1–8, 10–13 ^a	Negative	Negative
Patient 9 ^b	Positive	Positive
Participant 1–4, 6–8, 10–20 ^a	Negative	Negative
Participant 5 ^b	Positive	Positive
Participant 9 ^c	Positive	Negative

^aFor clarity, participants and patients with identical test results have been grouped together in this table. ^bFemales individual. ^cMales individual. STI: Sexually transmitted infections

TABLE 6: Diagnostic agreement between home-based STI tests and hospital-standard laboratory STI tests of *Neisseria gonorrhoeae* (contingency table)

	Hospital test positive	Hospital test negative	Total
Home test positive	2 (TP)	1 (FP)	3
Home test negative	0 (FN)	30 (TN)	30
Total	2	31	33

STI: Sexually transmitted infections, TP: True positives, TN: True negatives, FN: False negatives, FP: False positives

infections were correctly identified, and no cases were missed. Specificity = 96.8%, indicating that nearly all TNs were accurately classified. PPV = 66.7%, slightly reduced due to one false-positive result (Participant 9). In general, the accuracy of the diagnosis was 97%. (κ) was calculated to be 0.786, which indicates a substantial agreement in the results of the two testing procedures. Such findings suggest that home-based test exhibits greater diagnostics in detecting NG, and with high agreement compared to the standard hospital technique. However, occasional FPs may occur and should be considered when interpreting individual test results. The association between home-based and hospital-standard test results for NG was statistically significant ($P = 0.0057$, Fisher's Exact Test, two-tailed).

Table 8 presents the diagnostic outcomes of home-based versus hospital-standard STI testing for TV. Among the 24 individuals (females only) tested, 22 yielded concordant negative results in both methods. One participant (Participant 3) tested positive with both methods, while another participant (Participant 12) tested positive only by the home-based test but negative by the hospital-standard test, representing a discordant result.

TABLE 7: Diagnostic performance metrics for home-based STI testing for *Neisseria gonorrhoeae*

Metric	Formula	Result (%)
Sensitivity	$TP/(TP+FN)=2/(2+0)$	100
Specificity	$TN/(TN+FP)=30/(30+1)$	96.8
PPV	$TP/(TP+FP)=2/(2+1)$	66.7
NPV	$TN/(TN+FN)=30/(30+0)$	100
Accuracy	$(TP+TN)/total=(2+30)/33$	97
Cohen's kappa (κ)	$(Po-Pe)/(1-Pe)=(0.970-0.860)/(1-0.860) \approx 0.786^a$	0.786 ^a

^a0.786 (Substantial Agreement) based on standard interpretation. STI: Sexually transmitted infections, NPV: Negative predictive value, PPV: Positive predictive value, TP: True positives, TN: True negatives, FN: False negatives, FP: False positives

TABLE 8: Diagnostic test results for 24 individuals (females only) comparing home-based and hospital-standard STI testing for *Trichomonas vaginalis*

ID (s)	Home-based STI test	Hospital-standard STI test
Patient 1–7, 9 ^a	Negative	Negative
Participant 1–2, 4–8, 13–19 ^a	Negative	Negative
Participant 3	Positive	Positive
Participant 12	Positive	Negative

^aFor clarity, participants and patients with identical test results have been grouped together in this table. STI: Sexually transmitted infections

The contingency table for TV (Table 9) summarizes the diagnostic agreement between home-based and hospital-standard tests. Of the 24 samples (females only), there was one TP, one FP, no FN, and 22 TN, indicating a high level of agreement between the two methods with only a single discordant result.

Table 10 shows the diagnostic performance metrics of the home-based assay compared with the hospital-standard method as a reference. The sensitivity was 100%, indicating that all hospital-confirmed positives were detected by the home-based test. Specificity was 95.7%, due to one false-positive result. The PPV was 50.0%, reflecting the low prevalence of confirmed positives in this cohort, while the NPV was 100%, indicating that all negative home-based test results were reliable. The accuracy was still high at 95.8%, and $\kappa = 0.65$ that showed substantial agreement between the two testing methods, consistent with the high overall agreement.

Statistical analysis with Fisher's exact test (two-tailed) showed p-value of 0.083, representing no statistically significant difference between the home-based and hospital-standard assays for detecting TV within this study group.

TABLE 9: Diagnostic agreement between home-based STI tests and hospital-standard laboratory STI tests of *Trichomonas vaginalis* (2x2 contingency table)

	Hospital test positive	Hospital test negative	Total
Home test positive	1 (TP)	1 (FP)	2
Home test negative	0 (FN)	22 (TN)	22
Total	1	23	24

STI: Sexually transmitted infections, TP: True positives, TN: True negatives, FN: False negatives, FP: False positives

TABLE 10: Diagnostic performance metrics of home-based STI testing for *Trichomonas vaginalis*

Metric	Formula	Result (%)
Sensitivity	$TP/(TP+FN)=1/(1+0)$	100
Specificity	$TN/(TN+FP)=22/(22+1)$	95.7
PPV	$TP/(TP+FP)=1/(1+1)$	50.0
NPV	$TN/(TN+FN)=22/(22+0)$	100
Accuracy	$(TP+TN)/Total=(1+22)/24$	95.8
Cohen's kappa (κ)	$(Po-Pe)/(1-Pe)=(0.958-0.881)/(1-0.881)=0.65$	0.65 ^a

^a0.65 (Substantial Agreement) based on standard interpretation. STI: Sexually transmitted infections, NPV: Negative predictive value, PPV: Positive predictive value, TP: True positives, TN: True negatives, FN: False negatives, FP: False positives

4. DISCUSSION

Screening for STIs is essential because most CT, NG, and TV infections are without symptoms and therefore often remain undiagnosed or untreated. If left untreated, these infections can result in serious complications. In women, it develops into PID, tubal infertility, ectopic pregnancy, and chronic pelvic pain, whereas in men, it may develop into epididymitis [3], [24]. These clinical implications emphasize the need to increase the availability and acceptability of diagnostic options, especially in areas where cultural traditions and access to healthcare restrict prompt diagnosis and treatment. The social, economic, and biological factors make women at greater risk of STIs than men. In addition, self-reporting behavior plays a significant role in the prevention and management of STIs [25].

The results of this study suggest that home-based rapid diagnostic tests may serve as a promising alternative to hospital-based standard STI screening in culturally conservative areas, such as in Iraq and the Kurdistan Region. Sample collection procedures followed recommended guidelines to ensure methodological accuracy. Evidence from prior studies suggests that self-collected or home-based specimens can yield diagnostic accuracy comparable to clinician-collected samples, particularly for detecting CT, NG, and TV [26]–[30], which reinforces the validity of our approach. Ideal urogenital specimen types for screening CT, NG, and TV using NAATs are first-catch urine specimen for men and vaginal swabs for women. NAATs for TV have not received FDA clearance for application in men [31]. Even a majority of women, about 75%, prefer home sampling due to convenience and privacy according studies report [26].

Although estimating prevalence was not the primary objective of this pilot study, CT was detected in 3/33 (9.1%), NG in 2/33 (6.1%), and TV in 1/24 (4.2%) female individuals, as TV testing was performed only in females. These figures are consistent with, though slightly lower than, previously reported Iraqi prevalence rates. For example, Ghaima (2022) found rates of 14.8% for CT and 7.4% for NG among symptomatic patients in Baghdad [32], while [33] found an NG incidence of 8.97% among adult males presenting with urethritis in Erbil. In addition, regional data on TV prevalence support our findings. In Duhok (Kurdistan region), Ismael (2024) reported a 6.0% positivity rate for TV among 400 symptomatic women based on direct smear microscopy [34]. In Duhok city, Iraq the rate of TV was 9% among women based on wet-mount microscopic

examination of vaginal swab [35]. And in the world, the most recent prevalence estimates of trichomoniasis in women was 5.3% [12]. These comparisons indicate that home-based testing can identify infection rates similar to those from clinic-based surveillance, even across diverse study populations. Our study population included both symptomatic and asymptomatic individuals, highlighting the challenge of diagnosing both overt and silent infections. Detection of infections in asymptomatic individuals who do not have any symptoms emphasizes the importance of screening, as many STIs do not show any symptoms but still contribute to transmission and long-term complications.

The assessment of the home-based test for CT demonstrated highly accurate diagnostic efficacy in comparison to the hospital reference method. Both methods consistently identified all 3 positive and 30 negative cases, yielding 100% sensitivity, specificity, PPV, NPV, and overall accuracy [36]. The κ value of 1.00 also showed that the two diagnostic methods were completely in agreement. The relationship between the test results was also highly significant (Fisher's Exact Test, $P = 0.0002$). These results emphasize the possibility of using home-based testing to address cultural and logistical obstacles to clinic-based STI screening. Home-based approaches have the potential to enhance testing among individuals who do not want to get tested in in-person care due to concerns about judgment, privacy, or cultural restrictions. Our findings are consistent with [37], who reported that although NAATs are the gold standard, well-validated home-based rapid tests or antigen-based point-of-care tests (POCTs) can offer robust initial screening performance, especially in resource-constrained settings [37], which mentioned that CT home-based rapid tests are still useful in clinical practice, even though they are less sensitive than NAATs because they are cheap, simple to use, visually interpretable, and provide quick results. They also meet the ASSURED (affordable, sensitive, specific, user-friendly, rapid, robust, equipment-free, and deliverable to end-users) criteria for POCTs.

Many studies have found that people are generally comfortable using self-testing methods. According to [38], self-testing for chlamydia is widely accepted, and once diagnosed, the disease can be treated successfully. Both NAATs and immunoassays have considerably improved CT diagnosis. NAATs offer high sensitivity and specificity, but their higher cost and technical complexity limit their use in low-resource settings or in developing countries [39]. The CDC also recommends the same for NAATs, which

are used to detect CT and NG by amplifying target-specific nucleic acids [40]. Compared to NAATs, immunoassays are less expensive and less complicated than NAATs, but their historically lower sensitivity has limited their use as rapid tests. However, new, more sensitive immunoassay systems may help close this gap and expand their role in POCT settings [39], [41].

In the case of NG, the home-based test showed strong diagnostic performance compared to the hospital reference method. “Both laboratory-confirmed infections (true infections) were correctly identified (sensitivity = 100%), and all negatives were accurately detected (NPV = 100%). Specificity was slightly lower at 96.8% due to one false-positive result, which reduced the PPV to 66.7% and resulted in $\kappa = 0.786$, indicating substantial agreement between methods [36]. The relationship between home-based and hospital-standard results was statistically significant (Fisher’s Exact Test, $P = 0.0057$). These results support the reliability of home-based NG testing, but the occasional FP illustrates the importance of confirmatory testing, especially in low-prevalence populations where predictive values are more affected. Peters *et al.* (2024) reported similar concerns, showing that non-molecular antigen detection methods, such as lateral flow assays (LFAs), offer cost-effective NG detection with a sensitivity of 91.7–96.1% and a specificity of 96.3–97.2% [42]. With such innovations, they are an influential addition to molecular diagnostics in terms of clinical management optimization and reducing unnecessary antibiotic use, particularly in resource-limited areas where testing with laboratory-based methods is unavailable. Whereas, in well-resourced settings, molecular diagnostics are preferable, their price and infrastructural requirements restrict their use in the lower-income areas, and thus, low-cost POCTs ought to be a national health concern. Although molecular diagnostics are the best choice in places with well-resourced settings, they are expensive and require too much infrastructure to be used in lower-income regions. This shows that making POCTs affordable should be a public health priority.

The home-based TV test demonstrated strong diagnostic performance, with 100% sensitivity, 95.7% specificity, 100% NPV, and 95.8% overall accuracy. Cohen’s kappa coefficient ($\kappa = 0.65$) showed substantial agreement. The optimal sensitivity and NPV support high confidence in negative results from the home-based test, confirming the test’s reliability as a screening tool for diseases. The lower PPV (50%) reflects the low prevalence within this cohort,

which can disproportionately affect predictive value when even a single FP occurs [36]. Similar findings have been reported for the FDA-approved OSOM test, which is a rapid immunochromatographic capillary-flow enzyme immunoassay used to detect vaginal TV antigen. The OSOM test is easy to interpret, simple, does not require any special instruments, and provides results within 10–15 min. Compared to NAATs, it is 83 to 86% accurate and sensitive in women. However, its performance in men is lower due to reduced sensitivity [43], [44]. Self-administered testing is highly feasible and acceptable, with over 90% of women willing to use these tests and achieving >99% accuracy in both execution and interpretation [43]. These results show that the one discrepancy in our study points to the need for confirmatory testing of positive home-based results, which aligns with standard STI diagnostic recommendations. However, due to its high sensitivity and strong concordance with hospital-based testing, home-based TV screening could significantly contribute to reducing undiagnosed infections, especially in situations where privacy concerns, stigma, or limited clinical access are barriers. Our findings confirm prior evidence that robust concordance between home-based and conventional tests facilitates their incorporation into public health initiatives.

The FDA’s approval of over-the-counter STI kits highlights the viability of reliable self-testing. However, it is still important to make affordable at-home screening more widely available to meet CDC standards and reduce STI rates. In line with this, Graseck *et al.* (2010) demonstrated that home-based CT/NG testing has diagnostic accuracy similar to that of clinic-based screening in these populations [26]. Similarly, other studies indicate that home-based testing is a valuable complement, especially where stigma, privacy concerns, or limited healthcare access restrict clinic-based screening [24], [40], [45]. Likewise, Cook *et al.* (2007) reported that home screening tests are practicable, with sensitivities of over 90% and specificities of over 99% for CT and NG detection, while also addressing barriers such as privacy concerns, embarrassment, and difficulty reaching a healthcare facility [46].

Studies in Brazil and South Africa show that self-performed rapid antigen tests for TV (e.g., OSOM) have high specificity (99%) and moderate sensitivity (77%) compared with PCR [47], paralleling the performance of CT and NG. These findings support the reliability and public health value of home-based testing for multiple STIs and reinforce the feasibility of incorporating TV testing into home-based screening strategies. Our results

are consistent with evidence that strong agreement between home-based and standard tests makes them a valuable complementary tool, especially in limited healthcare access areas with privacy concerns [40].

Finally, POCTs for STIs support rapid diagnosis and treatment, reduce the number of people who do not follow up, and improve STI control in places with limited resources. This advantage is particularly important for countries with low or middle incomes, where syndromic management often fails to detect asymptomatic infections [48]. Home-based testing is also expected to be much less expensive than clinic tests, which require dedicated facilities, sterile materials, and qualified clinicians [46]. Patients can self-administer rapid home tests, increasing accessibility and enabling earlier, more effective disease identification.

In light of these findings, home-based rapid diagnostic tests for CT, NG, and TV may serve as effective diagnostic or preliminary screening methods, particularly in communities experiencing stigma, restricted healthcare access, or privacy concerns. When presented with clear instructions for using appropriate confirmatory testing pathways, validated home-based tests are considered a useful and reliable choice for both clinical and non-clinical uses.

4.1. Limitations

There are some limitations with this study. The relatively small sample size ($n = 33$), which is appropriate for a pilot study, limits the statistical power and generalizability of the findings. Larger multi-center studies are required to validate these preliminary observations across more diverse populations. There was no follow-up testing; therefore, we could not see if the results were repeatable or if new infections were found over time. Only one rapid home-based test was evaluated, and comparisons with other assays or molecular techniques were not included. Individuals were selected from a particular geographic region, which may limit the applicability of results to other populations in Iraq or internationally. These limitations highlight the need for larger, multi-center studies with NAATs validation and follow-up testing to confirm and expand these findings.

5. CONCLUSION

This pilot study shows that home-based rapid tests for CT, NG, and TV are as effective as hospital-based testing, even in conservative settings such as the Kurdistan

Region. Using these tests at home helps individuals navigate barriers including stigma, confidentiality issues, and restricted healthcare access, providing an effective option for early detection and treatment. Positive results still need to be confirmed to avoid false diagnoses. According to our knowledge, this is the first study in the region to directly compare the performance of self-administered tests with standard hospital testing, providing region-specific evidence of their diagnostic accuracy and practical applicability. These findings suggest that validated self-tests can be integrated into screening programs in culturally conservative, low-resource settings, provided that confirmatory and regulatory measures are in place. Further research with larger, more diverse cohorts and the inclusion of viral STIs will improve generalizability. Digital health tools, including mobile reporting and telehealth, could further increase accessibility and support follow-up in the region.

REFERENCES

- [1] M. Díez and A. Díaz. "Sexually transmitted infections: Epidemiology and control". *Revista Espanola De Sanidad Penitenciaria*, vol. 13, no. 2, pp. 58-66, 2011.
- [2] J. Sharifi-Rad, C. Quispe, A. Rahavian, J. Carneiro, J. E. Rocha, A. L. A. Borges Leal, M. F. B. Morais Braga, H. Coutinho, A. A. Djafari, P. Alarcon-Zapata, M. Martorell, G. Antika, T. Boyunegmez Tumer and D. Calina. "Bioactive compounds as potential agents for sexually transmitted diseases management: A review to explore molecular mechanisms of action". *Frontiers in Pharmacology*, vol. 12, p. 674682, 2021.
- [3] M. R. Garcia, S. W. Leslie and A. A. Wray. "Sexually transmitted infections". In: *StatPearls*. StatPearls Publishing, Treasure Island, FL, 2025.
- [4] A. De Schryver and A. Meheus. "Epidemiology of sexually transmitted diseases: The global picture". *Bull World Health Organ*, vol. 68, no. 5, pp. 639-654, 1990.
- [5] WHO. "*Sexually Transmitted Infections (STIs)*". World Health Organization. Available from: [https://www.who.int/news-room/fact-sheets/detail/sexually-transmitted-infections-\(stis\)](https://www.who.int/news-room/fact-sheets/detail/sexually-transmitted-infections-(stis)) [Last accessed on 2023 Nov 18].
- [6] M. Unemo, M. M. Lahra, M. Escher, S. Eremin, M. J. Cole, P. Galarza, F. Ndowa, I. Martin, J. A. R. Dillon, M. Galas, P. Ramon-Pardo, H. Weinstock and T. Wi. "WHO global antimicrobial resistance surveillance for *Neisseria gonorrhoeae* 2017-18: A retrospective observational study". *The Lancet Microbe*, vol. 2, no. 11, pp. e627-e636, 2021.
- [7] H. W. Chesson, P. Mayaud and S. O. Aral. "*Sexually Transmitted infections: Impact and Cost-Effectiveness of Prevention*". The World Bank, Washington, DC, 2017.
- [8] Hologic Inc. "*Aptima Combo 2® Assay (Panther® System)*". Hologic, United States, 2017.
- [9] C. Springer and P. Salen. "*Gonorrhea*". StatPearls Publishing, Florida, 2020.
- [10] L. K. Ng and I. E. Martin. "The laboratory diagnosis of *Neisseria*

- gonorrhoeae". *Canadian Journal of Infectious Diseases and Medical Microbiology*, vol. 16, no. 1, pp. 15-25, 2005.
- [11] J. A. Schumann and S. Plasner. "Trichomoniasis". StatPearls Publishing, Treasure Island, FL, 2023.
 - [12] O. T. Van Gerwen, S. A. Opsteen, K. J. Graves and C. A. Muzny. "Trichomoniasis". *Infectious Disease Clinics of North America*, vol. 37, no. 2, pp. 245-265, 2023.
 - [13] Hologic Inc. "Aptima™ *Trichomonas vaginalis* Assay package insert". 2017. Available from: https://www.hologic.com/sites/default/files/package-insert/503797-IFU-PI_002_01.pdf [Last accessed on 2025 Sep 18].
 - [14] F. M. Wagenlehner, N. H. Brockmeyer, T. Discher, K. Friebe and T. A. Wichelhaus. "The presentation, diagnosis, and treatment of sexually transmitted infections". *Deutsches Ärzteblatt International*, vol. 113, no. 1-2, pp. 11-22, 2016.
 - [15] M. Balfe, R. Brugha, D. O'Donovan, E. O'Connell and D. Vaughan. "Triggers of self-conscious emotions in the sexually transmitted infection testing process". *BMC Research Notes*, vol. 3, no. 1, p. 229, 2010.
 - [16] G. Al-Gburi, A. Al-Shakarchi, J. D. Al-Dabagh and F. Lami. "Assessing knowledge, attitudes, and practices toward sexually transmitted infections among Baghdad undergraduate students for research-guided sexual health education". *Frontiers in Public Health*, vol. 11, p. 1017300, 2023.
 - [17] J. Y. Lebni, S. F. Irandoost, A. A. Dehghan, A. Ziapour, B. Khosravi and N. Mehedi. "Exploring the reasons for women to engage in sex work in Tehran, Iran: A qualitative study". *Heliyon*, vol. 7, no. 12, p. e08512, 2021.
 - [18] C. Elendu, D. C. Amaechi, I. D. Elendu, T. C. Elendu, E. C. Amaechi, E. U. Usoro, N. L. Chima-Ogbuiyi, D. B. Arrey Agbor, C. J. Onwuegbule, E. F. Afolayan and B. B. Balogun. "Global perspectives on the burden of sexually transmitted diseases: A narrative review". *Medicine (Baltimore)*, vol. 103, no. 20, p. e38199, 2024.
 - [19] H. Y. Kim. "Statistical notes for clinical researchers: Chi-squared test and Fisher's exact test". *Restorative Dentistry and Endodontics*, vol. 42, no. 2, p. 152, 2017.
 - [20] M. L. McHugh. "The chi-square test of independence". *Biochemia Medica (Zagreb)*, vol. 23, no. 2, pp. 143-149, 2013.
 - [21] D. G. Altman. "Practical Statistics for Medical Research". Chapman and Hall/CRC, United States, 1990.
 - [22] M. L. McHugh. "Interrater reliability: The kappa statistic". *Biochemia Medica (Zagreb)*, vol. 22, no. 3, pp. 276-282, 2012.
 - [23] J. R. Landis and G. G. Koch. "The measurement of observer agreement for categorical data". *Biometrics*, vol. 33, pp. 159-174, 1977.
 - [24] S. L. Shih, A. S. Graseck, G. M. Secura and J. F. Peipert. "Screening for sexually transmitted infections at home or in the clinic?" *Current Opinion in Infectious Diseases*, vol. 24, no. 1, pp. 78-84, 2011.
 - [25] B. M. Birhane, A. Simegn, W. A. Bayih, E. S. Chanie, B. Demissie, Z. M. Yalew, H. Alemaw and D. M. Belay. "Self-reported syndromes of sexually transmitted infections and its associated factors among reproductive (15-49 years) age women in Ethiopia". *Heliyon*, vol. 7, no. 7, p. e07524, 2021.
 - [26] A. S. Graseck, G. M. Secura, J. E. Allsworth, T. Madden and J. F. Peipert. "Home compared with clinic-based screening for sexually transmitted infections: A randomized controlled trial". *Obstetrics and Gynecology*, vol. 116, no. 6, pp. 1311-1318, 2010.
 - [27] L. Fajardo-Bernal, J. Aponte-Gonzalez, P. Vigil, E. Angel-Müller, C. Rincon, H. G. Gaitán and N. Low. "Home-based versus clinic-based specimen collection in the management of *Chlamydia trachomatis* and *Neisseria gonorrhoeae* infections". *Cochrane Database of Systematic Reviews*, vol. 9, no. 9, p. CD011317, 2015.
 - [28] Z. Khan, A. Bhargava, P. Mittal, R. Bharti, P. Puri, N. Khunger and M. Bala. "Evaluation of reliability of self-collected vaginal swabs over physician-collected samples for diagnosis of bacterial vaginosis, candidiasis and trichomoniasis, in a resource-limited setting: A cross-sectional study in India". *BMJ Open*, vol. 9, no. 8, p. e025013, 2019.
 - [29] Z. N. Jaya, W. Mapanga, B. Van Niekerk, T. Dlangalala, K. Kgarosi, M. Dzobo, D. Mulqueeny and T. P. Mashamba-Thompson. "Mapping evidence of self-sampling to diagnose sexually transmitted infections in women: A scoping review". *Diagnostics (Basel)*, vol. 12, no. 8, p. 1803, 2022.
 - [30] Z. Jaya, W. Mapanga, T. Dlangalala, N. Thembane, K. Kgarosi, and T. Dzinamarira. "Accuracy of self-collected versus healthcare worker collected specimens for diagnosing sexually transmitted infections in females: An updated systematic review and meta-analysis". *Scientific Reports*, vol. 14, no. 1, p. 10496, 2024.
 - [31] K. A. Workowski, L. H. Bachmann, P. A. Chan, C. M. Johnston, C. A. Muzny, I. Park, H. Reno, J. M. Zenilman and G. A. Bolan. "Sexually transmitted infections treatment guidelines, 2021". *MMWR Recommendations and Reports*, vol. 70, no. 4, pp. 1-187, 2021.
 - [32] R. B. Ali and K. K. Ghaima. "Molecular detection of some sexually transmitted bacteria and *Trichomonas vaginalis* in Iraqi married couples". *Iraqi Journal of Biotechnology*, vol. 21, no. 2, pp. 76-84, 2022.
 - [33] I. Y. Mansoor. "Prevalence of Gonorrhea among adult male with urethritis in Erbil City". *Zanco Journal of Medical Sciences*, vol. 18, no. 2, pp. 692-696, 2014.
 - [34] S. S. Ismael. "Prevalence of *Trichomoniasis* and *Vulvovaginal candidiasis* among married women in Duhok City, Kurdistan Region, Iraq". *Archives of Razi Institute*, vol. 79, no. 2, pp. 303-306, 2024.
 - [35] M. Adil Murad, S. A. Ibrahim and A. Y. Mahmood. "Distribution and risk factors of *Trichomonas vaginalis* infection with relevance to interleukin profile among population in Duhok city, Iraq". *Clinical Epidemiology and Global Health*, vol. 30, p. 101784, 2024.
 - [36] D. G. Altman and J. M. Bland. "Statistics notes: Diagnostic tests 2: Predictive values". *BMJ*, vol. 309, no. 6947, p. 102, 1994.
 - [37] M. T. Ha, T. L. Pham, T. A. Nguyen and V. T. Le. "Performance of antigen-based rapid test for *Chlamydia trachomatis* in comparison with polymerase chain reaction test". *Medicina Clínica Práctica*, vol. 7, no. 3, p. 100447, 2024.
 - [38] R. Powell, H. M. Pattison and J. F. Marriott. "Perceptions of self-testing for Chlamydia: understanding and predicting self-test use". *Healthcare*, vol. 4, no. 2, p. 25, 2016.
 - [39] W. H. Su, T. S. Tsou, C. S. Chen, T. Y. Ho, W. L. Lee, Y. Y. Yu, T. J. Chen, C. H. Tan and P. H. Wang. "Diagnosis of Chlamydia infection in women". *Taiwanese Journal of Obstetrics and Gynecology*, vol. 50, no. 3, pp. 261-267, 2011.
 - [40] T. A. Peterman, K. Kreisel, M. A. Habel, W. S. Pearson, P. J. Dittus, and J. R. Papp. "Preparing for the chlamydia and gonorrhea self-test". *Sexually Transmitted Infection*, vol. 45, no. 3, pp. e7-e9, 2018.
 - [41] Z. Lei, Y. Feng and Z. Junzhe. "Performance evaluation of the Chlamydia Rapid test for qualitative detection of Chlamydial antigens in clinical diagnosis". *MEDS Clinical Medicine*, vol. 5, no. 1, pp. 158-163, 2024.

- [42] R. P. Peters, J. D. Klausner, L. Mazzola, M. M. Mdingi, H. Jung, R. M. S. Gigi, J. Piton, J. Daniels, L. De Vos, P. C. Adamson, B. Gleeson and C. Ferreyra. "Novel lateral flow assay for point-of-care detection of *Neisseria gonorrhoeae* infection in syndromic management settings: A cross-sectional performance evaluation". *Lancet*, vol. 403, no. 10427, pp. 657-664, 2024.
- [43] B. Van Der Pol, S. N. Taylor, L. Mena, J. Lebed, J. McNeil, L. Crane, A. Ermel, A. Sukhija-Cohen and C. A. Gaydos. "Evaluation of the Performance of a point-of-care test for Chlamydia and Gonorrhea". *JAMA Netw Open*, vol. 3, no. 5, p. e204819, 2020.
- [44] C. A. Gaydos, J. D. Klausner, N. P. Pai, H. Kelly, C. Coltart and R. W. Peeling. "Rapid and point-of-care tests for the diagnosis of *Trichomonas vaginalis* in women and men". *Sexually Transmitted Infection*, vol. 93, no. S4, pp. S31-S35, 2017.
- [45] A. L. McRee, A. Esber and P. L. Reiter. "Acceptability of home-based chlamydia and gonorrhea testing among a national sample of sexual minority young adults." *Perspectives on Sexual and Reproductive Health*, vol. 47, no. 1, pp. 3-10, 2015.
- [46] R. L. Cook, L. Østergaard, S. L. Hillier, P. J. Murray, C. C. Chang, D. M. Comer, R. B. Ness and DAISY Study Team. "Home screening for sexually transmitted diseases in high-risk young women: Randomised controlled trial". *Sexually transmitted infection*, vol. 83, no. 4, pp. 286-291, 2007.
- [47] H. E. Jones, S. A. Lippman, H. H. Caiaffa-Filho, T. Young and J. H. Van De Wijgert, "Performance of a rapid self-test for detection of *Trichomonas vaginalis* in south Africa and Brazil". *Journal of Clinical Microbiology*, vol. 51, no. 3, pp. 1037-1039, 2013.
- [48] K. Martin, R. Wenlock, T. Roper, C. Butler and J. H. Vera. "Facilitators and barriers to point-of-care testing for sexually transmitted infections in low-and middle-income countries: A scoping review". *BMC Infectious Diseases*, vol. 22, no. 1, p. 561, 2022.